

PROJECT INITIATION / Phase 2

Title: Network Intrusion Protection: IPS and IDS Overview

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Executive Summary

This report documents the successful implementation of an Intrusion Detection System (IDS) using Snort 3 on Kali Linux.

The project demonstrates real-time network traffic inspection , custom rule creation , and threat detection capabilities in a virtualized environment.

The system was tested against multiple attack vectors including ICMP ping floods, port scans, and network reconnaissance attempts with successful detection and logging of all identified threats.

Detection Rules

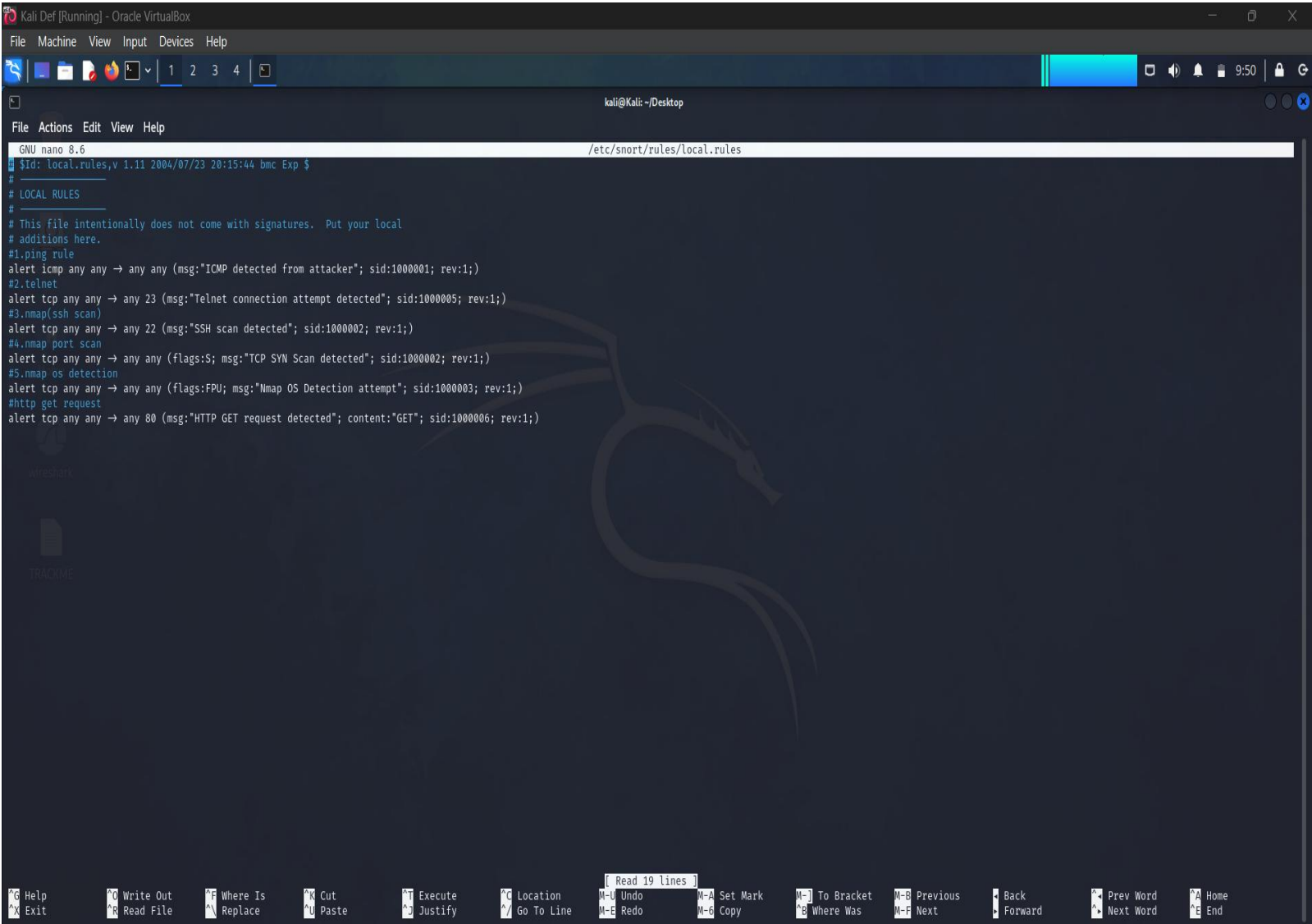
Snort rules follow a specific syntax:

```
alert protocol src_ip src_port -> dst_ip dst_port
```

```
(msg:"Description"; sid:unique_id; rev:version; content:"pattern";)
```

Components:

- alert → Action (alert/drop/reject)
- protocol → TCP, UDP, ICMP, IP
- src_ip/src_port → Source (any = all)
- dst_ip/dst_port → Destination
- msg → Alert message
- sid → Unique rule ID



-

Detection Summary Table

Attack Type	Rule SID	Detection Status	Alerts Generated
ICMP Ping	1000001	✓ Detected	+20 alerts
TCP SYN Scan	1000002	✓ Detected	~1000 alerts
Nmap OS Detection	1000003	✓ Detected	Multiple alerts

Attack Type	Rule SID	Detection Status	Alerts Generated
SSH Attempt	1000005	✓ Detected	Multiple attempts
Telnet Attempt	1000006	PARTIAL	Connection refused
HTTP Traffic	1000007	PARTIAL	Web requests

Conclusion

This project successfully demonstrated the implementation and operation of an Intrusion Detection System using Snort 3 on Kali Linux. The system effectively detected multiple attack vectors including network reconnaissance, port scanning, and service enumeration attempts.

Key Achievements:

- ✓ Installed and configured Snort 3 in passive IDS mode
- ✓ Created custom detection rules for 5+ attack types
- ✓ Successfully detected and logged all test attacks
- ✓ Generated comprehensive alert logs
- ✓ Identified and resolved technical challenges
- ✓ Established foundation for IPS implementation

The platform is now ready for transition to active Intrusion Prevention mode where detected attacks will be blocked in real-time rather than merely logged and alerted. This project provides valuable hands-on experience with network security tools and concepts essential for professional cybersecurity practice.

SCREENSHOT FOR TESTING

```
sudo snort -c /etc/snort/snort.lua -T
```

```
# Run IDS
```

```
sudo snort -c /etc/snort/snort.lua -i eth0 -A alert_fast
```

Test connectivity(PING) , NMAP(SYN,OS) , SSH , TELNET , HTTP

```
(kali@Kali)-[~]
$ ping 192.168.56.110
PING 192.168.56.110 (192.168.56.110) 56(84) bytes of data.
64 bytes from 192.168.56.110: icmp_seq=1 ttl=64 time=1.03 ms
64 bytes from 192.168.56.110: icmp_seq=2 ttl=64 time=0.680 ms
64 bytes from 192.168.56.110: icmp_seq=3 ttl=64 time=0.634 ms
64 bytes from 192.168.56.110: icmp_seq=4 ttl=64 time=0.515 ms
64 bytes from 192.168.56.110: icmp_seq=5 ttl=64 time=0.550 ms
64 bytes from 192.168.56.110: icmp_seq=6 ttl=64 time=0.683 ms
64 bytes from 192.168.56.110: icmp_seq=7 ttl=64 time=0.453 ms
64 bytes from 192.168.56.110: icmp_seq=8 ttl=64 time=2.15 ms
64 bytes from 192.168.56.110: icmp_seq=9 ttl=64 time=0.536 ms
^C
-- 192.168.56.110 ping statistics --
9 packets transmitted, 9 received, 0% packet loss, time 8127ms
rtt min/avg/max/mdev = 0.453/0.802/2.146/0.500 ms

(kali@Kali)-[~]
::1      dvwa.v      gravimind.v  ip6-loopback metasploitable.pc webgoat.pc
Kali     ff02::1    ip6-allnodes juice-shop.pc metasploitable.v  webgoat.v
Kali.v   ff02::2    ip6-allrouters juice-shop.v  mutillidae.pc
dvwa.pc  gravimind.pc ip6-localhost localhost      mutillidae.v

(kali@Kali)-[~]
$ ss

total memory: 72.5498
pattern memory: 19.6904
match list memory: 28.5
transition memory: 23.9844
appid: MaxRss diff: 2816
appid: patterns loaded: 300

pcap DAQ configured to passive.
Commencing packet processing
Retry queue interval is: 200 ms
++ [0] eth0
12/17-09:26:12.468095 [**] [116:414:1] "(ipv4) IPv4 packet to broadcast dest address" [**] [Priority: 3] {UDP} 0.0.0.0:68 -> 255.255.255.255:67
12/17-09:26:12.468095 [**] [116:408:1] "(ipv4) IPv4 packet from 'current net' source address" [**] [Priority: 3] {UDP} 0.0.0.0:68 -> 255.255.255.255:67
12/17-09:26:12.468218 [**] [116:414:1] "(ipv4) IPv4 packet to broadcast dest address" [**] [Priority: 3] {UDP} 0.0.0.0:68 -> 255.255.255.255:67
12/17-09:26:12.468218 [**] [116:408:1] "(ipv4) IPv4 packet from 'current net' source address" [**] [Priority: 3] {UDP} 0.0.0.0:68 -> 255.255.255.255:67
12/17-09:26:12.468837 [**] [116:414:1] "(ipv4) IPv4 packet to broadcast dest address" [**] [Priority: 3] {UDP} 192.168.56.100:67 -> 255.255.255.255:68
12/17-09:26:12.469233 [**] [116:414:1] "(ipv4) IPv4 packet to broadcast dest address" [**] [Priority: 3] {UDP} 0.0.0.0:68 -> 255.255.255.255:67
12/17-09:26:12.469233 [**] [116:408:1] "(ipv4) IPv4 packet from 'current net' source address" [**] [Priority: 3] {UDP} 0.0.0.0:68 -> 255.255.255.255:67
12/17-09:26:12.469553 [**] [116:414:1] "(ipv4) IPv4 packet to broadcast dest address" [**] [Priority: 3] {UDP} 192.168.56.100:67 -> 255.255.255.255:68
12/17-09:26:12.469646 [**] [116:414:1] "(ipv4) IPv4 packet to broadcast dest address" [**] [Priority: 3] {UDP} 0.0.0.0:68 -> 255.255.255.255:67
12/17-09:26:12.469646 [**] [116:408:1] "(ipv4) IPv4 packet from 'current net' source address" [**] [Priority: 3] {UDP} 0.0.0.0:68 -> 255.255.255.255:67
12/17-09:26:12.476972 [**] [116:414:1] "(ipv4) IPv4 packet to broadcast dest address" [**] [Priority: 3] {UDP} 192.168.56.100:67 -> 255.255.255.255:68
12/17-09:26:12.482841 [**] [116:414:1] "(ipv4) IPv4 packet to broadcast dest address" [**] [Priority: 3] {UDP} 192.168.56.100:67 -> 255.255.255.255:68
12/17-09:27:36.219206 [**] [116:414:1] "(ipv4) IPv4 packet to broadcast dest address" [**] [Priority: 3] {UDP} 0.0.0.0:68 -> 255.255.255.255:67
12/17-09:27:36.219206 [**] [116:408:1] "(ipv4) IPv4 packet from 'current net' source address" [**] [Priority: 3] {UDP} 0.0.0.0:68 -> 255.255.255.255:67
12/17-09:27:36.226037 [**] [116:414:1] "(ipv4) IPv4 packet to broadcast dest address" [**] [Priority: 3] {UDP} 192.168.56.100:67 -> 255.255.255.255:68
12/17-09:27:36.252560 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} :: -> ff02::16
12/17-09:27:36.816784 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} :: -> ff02::16
12/17-09:27:37.044326 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} :: -> ff02::1:ff5c:52ce
12/17-09:27:38.069397 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} fe80::a00:27ff:fe5c:52ce -> ff02::16
12/17-09:27:38.120996 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} fe80::a00:27ff:fe5c:52ce -> ff02::16
12/17-09:27:38.189665 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} fe80::a00:27ff:fe5c:52ce -> ff02::2
```

Ethical-Hacker-Kali [Running] - Oracle VirtualBox

File Machine View Input Devices Help

1 2 3 4

kali@Kali: ~

File Actions Edit View Help

```
(kali@Kali)-[~]
$ nmap -sS 192.168.56.110
You requested a scan type which requires root privileges.
QUITTING!

(kali@Kali)-[~]
$ sudo nmap -sS 192.168.56.110
Starting Nmap 7.94 ( https://nmap.org ) at 2025-12-17 09:31 UTC
Nmap scan report for 192.168.56.110
Host is up (0.00093s latency).
Not shown: 999 closed tcp ports (reset)
PORT      STATE SERVICE
22/tcp    open  ssh
MAC Address: 08:00:27:43:33:02 (Oracle VirtualBox virtual NIC)

Nmap done: 1 IP address (1 host up) scanned in 13.27 seconds

(kali@Kali)-[~]
$
```

Right Ctrl

Kali Def [Running] - Oracle VirtualBox

File Machine View Input Devices Help

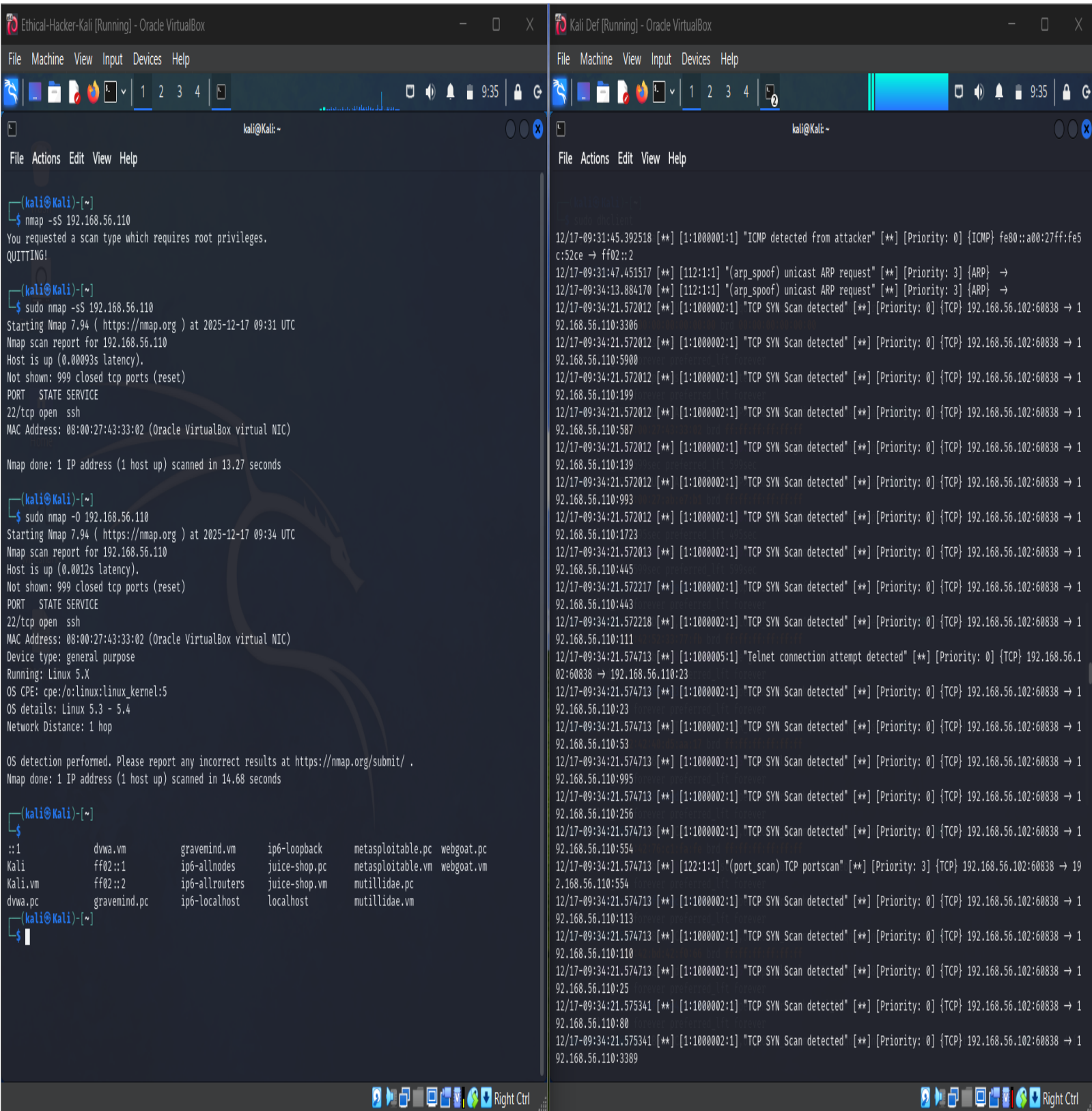
1 2 3 4

kali@Kali: ~

File Actions Edit View Help

```
12/17-09:29:03.867501 [**] [112:1:1] "(arp_spoof) unicast ARP request" [**] [Priority: 3] {ARP} →
12/17-09:29:04.752473 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} 192.168.56.102 →
192.168.56.110
12/17-09:29:04.752512 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} 192.168.56.110 →
192.168.56.102
12/17-09:29:05.778013 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} 192.168.56.102 →
192.168.56.110
12/17-09:29:05.778061 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} 192.168.56.110 →
192.168.56.102
12/17-09:29:06.778497 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} 192.168.56.102 →
192.168.56.110
12/17-09:29:06.778544 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} 192.168.56.110 →
192.168.56.102
12/17-09:29:39.756716 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} fe80::a00:27ff:fe5
c:52ce → ff02::2
12/17-09:31:42.258295 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:993
12/17-09:31:42.258296 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:5900
12/17-09:31:42.258296 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:8080
12/17-09:31:42.258296 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:22
12/17-09:31:42.258297 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:199
12/17-09:31:42.258297 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:256
12/17-09:31:42.258297 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:3389
12/17-09:31:42.258297 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:587
12/17-09:31:42.258591 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:1025
12/17-09:31:42.258591 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:135
12/17-09:31:42.260775 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:1723
12/17-09:31:42.260775 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:995
12/17-09:31:42.260775 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:111
12/17-09:31:42.260776 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
92.168.56.110:25
12/17-09:31:42.260776 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:48325 → 1
```

Right Ctrl




```
Ethical-Hacker-Kali [Running] - Oracle VirtualBox
File Machine View Input Devices Help
1 2 3 4
kali@Kali: ~
File Actions Edit View Help
kali@Kali: ~
$ telnet 192.168.56.110
Trying 192.168.56.110 ...
telnet: Unable to connect to remote host: Connection refused

kali@Kali: ~
$ sudo telnet 192.168.56.110
Trying 192.168.56.110 ...
telnet: Unable to connect to remote host: Connection refused

kali@Kali: ~
$ nmap -p 22,23,80,443 192.168.56.110
Starting Nmap 7.94 ( https://nmap.org ) at 2025-12-17 09:38 UTC
Nmap scan report for 192.168.56.110
Host is up (0.0013s latency).

PORT      STATE SERVICE
22/tcp    open  ssh
23/tcp    closed telnet
80/tcp    closed http
443/tcp   closed https

Nmap done: 1 IP address (1 host up) scanned in 13.05 seconds

kali@Kali: ~
$
:::1      dvwa.vvm      gravemind.vvm      ip6-loopback      metasploitable.pc      webgoat.pc
Kali      ff02::1      ip6-allnodes      juice-shop.pc      metasploitable.vvm      webgoat.vvm
Kali.vvm  ff02::2      ip6-allrouters    juice-shop.vvm      mutillidae.pc          mutillidae.vvm
dvwa.pc   gravemind.pc  ip6-localhost      localhost          mutillidae.vvm

kali@Kali: ~
$ ss
```

```
Kali Def [Running] - Oracle VirtualBox
File Machine View Input Devices Help
1 2 3 4
kali@Kali: ~
File Actions Edit View Help

12/17-09:34:21.777342 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:54052 → 192.168.56.110:22
12/17-09:34:21.877167 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:54053 → 192.168.56.110:22
12/17-09:34:21.980598 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:54054 → 192.168.56.110:22
12/17-09:34:22.082569 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:54055 → 192.168.56.110:22
12/17-09:34:22.181998 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:54056 → 192.168.56.110:22
12/17-09:34:22.284725 [**] [1:1000002:1] "TCP SYN Scan detected" [**] [Priority: 0] {TCP} 192.168.56.102:54057 → 192.168.56.110:22
12/17-09:34:22.310308 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} 192.168.56.102 → 192.168.56.110
12/17-09:34:22.310351 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} 192.168.56.110 → 192.168.56.102
12/17-09:34:22.335585 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} 192.168.56.102 → 192.168.56.110
12/17-09:34:22.335622 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} 192.168.56.110 → 192.168.56.102
12/17-09:34:22.361774 [**] [1:1000001:1] "ICMP detected from attacker" [**] [Priority: 0] {ICMP} 192.168.56.110 → 192.168.56.102
12/17-09:34:22.413998 [**] [116:423:1] "(tcp) TCP has no SYN, ACK, or RST" [**] [Priority: 3] {TCP} 192.168.56.102:54066 → 192.168.56.110:22
12/17-09:34:22.439230 [**] [116:401:1] "(tcp) Nmap XMAS attack detected" [**] [Priority: 3] {TCP} 192.168.56.102:54067 → 192.168.56.110:22
12/17-09:34:22.439230 [**] [116:420:1] "(tcp) TCP SYN with FIN" [**] [Priority: 3] {TCP} 192.168.56.102:54067 → 192.168.56.110:22
```